VII. Conclusions and Future Efforts

Survey results from 2008 in the Dry Tortugas region add to a growing dataset on the distribution, abundance, size, and condition of benthic coral reef organisms in the Florida Keys National Marine Sanctuary and specifically for the Tortugas region. Previous Quick Look Reports and data summaries, along with peer-reviewed publications, contribute to a growing volume of information collected in the larger Florida Keys ecosystem by our group and others, encompassing reef fishes, spiny lobster, and benthic coral reef organisms (Franklin et al. 2003, Ault et al. 2006, http://people.uncw.edu/millers). For many of the variables assessed, we have now compiled 10 years of data, starting in 1999, to evaluate the distribution and structure of coral reef and hard-bottom habitats within the Tortugas region. Data taken prior to and after the designation of the Tortugas North Ecological Reserve in the FKNMS and the Research Natural Area of DTNP will help resource managers determine the effects of extractive activities relative to other influences on the abundance and condition of benthic coral reef resources (Ault et al. 2006). Our plan is to compile results from the 1999-2008 sampling missions to help characterize the habitats in the region and to provide comparisons with spatial and temporal patterns using similar data collected in the rest of the Florida Keys. In addition to specific analyses for manuscripts, we plan to re-evaluate our existing habitat classification to further optimize our allocation strategy for future surveys. We also intend to continue to work closely with NMFS, RSMAS-UM, and FIU to compare community structure and condition variables with existing water quality, geological, and reef fish survey data.

The Dry Tortugas has a long history of scientific study, exemplified by several studies that have investigated the biology and geology of the area (e.g. Shinn et al. 1977, Davis 1982, Dustan 1985, Jaap et al. 1989). geomorphology and community structure dating back over a century (e.g. Shinn et al. 1977, Dustan 1985). In addition to representing the western extent of significant coral reef development in the Florida Keys archipelago, the area has been of long-standing importance due to its up-current location relative to the rest of the Florida Keys, and the lack of shoreline development. On the other hand, the region is not so remote that it totally escapes continental influence due to its proximity to the Florida mainland, as well as by oceanographic processes in the Caribbean, Gulf of Mexico, and the southwest Florida shelf. Indeed, Davis (1982), among many others, have emphasized the importance of the relative isolation of the Dry Tortugas as a benchmark for understanding natural dynamics versus changes and patterns caused by human activities. If anything, historical and recent observations document that substantial changes can occur in benthic communities and fish assemblages in the absence of known or obvious human influences due to tropical cyclones, winter cold-air outbreaks, “black-water” events, and disease (Davis 1982, Jaap et al. 1989, Ault et al. 2006). Such changes have occurred, even with national monument, national park, and national marine sanctuary designations over the past 30 years. For example, major mortality of staghorn corals (*Acropora cervicornis*)

occurred throughout the Tortugas region after the 1976-77 cold-air outbreak, where nearly all of the mapped staghorn corals in 1976 were dead by 1977 (Davis 1982). Changes in reef fish abundance have been attributed to protection in spatial management zones closed to fishing, but patterns in abundance and size are also influenced by recruitment events and storm-induced mortality (Ault et al. 2006).

The Dry Tortugas region is biologically significant for its complex habitats (Davis 1982, Franklin et al. 2003), diverse marine resources, and contribution to the recruitment and productivity of species, including recreationally and commercially important organisms (Ault et al. 2006). Because of its relatively remote location along the southwestern edge of the Florida shelf, the region benefits from ocean circulation patterns that appear to allow both local retention and regional distribution of larvae, especially important for down-current locations that have experienced further resource declines (Ault et al. 2002).

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